Nur ad-Din al-Bitruji

Nūr al-Dīn ibn Isḥaq al-Biṭrūjī (Arabic: نور الدين ابن إسحاق البطروجي, died c. 1204), known in the West by the Latinized name of **Alpetragius**, was an Arab[2][3] astronomer and qadi in al-Andalus.[4] Al-Biṭrūjī was the first astronomer to present the concentric spheres model as an alternative to the Ptolemaic system, with the planets borne by geocentric spheres. Another original aspect of his system was proposing a physical cause of celestial motions.[4] His alternative system spread through most of Europe during the 13th century.[1]

The crater Alpetragius on the Moon is named after him.

Life

Almost nothing about his life is known, except that his name probably derives from Los Pedroches (al-Biṭrawsh), a region near Cordoba.[4] He was a disciple of Ibn Tufail (Abubacer) and was a contemporary of Averroes.

Planetary model

Al-Bitruji proposed a theory on planetary motion in which he wished to avoid both epicycles and eccentrics,[5] and to account for the phenomena peculiar to the wandering stars, by compounding rotations of homocentric spheres. This was a modification of the system of planetary motion proposed by his predecessors, Ibn Bajjah (Avempace) and Ibn Tufail (Abubacer). He was unsuccessful in replacing Ptolemy's planetary model, as the numerical predictions of the planetary positions in his configuration were less accurate than those of the Ptolemaic model,[6] because of the difficulty of mapping Ptolemy's epicyclic model onto Aristotle's concentric spheres.

It was suggested based on the Latin translations that his system is an update and reformulation of that of Eudoxus of Cnidus combined with the motion of fixed stars developed by al-Zarqālī.

Nur ad-Din al-Bitruji	
Born	12th century
Died	c. 1204
Academic background	
Influences	Avempace, Ibn Tufail, al-Zarqali
Academic work	
Era	Islamic Golden Age
Main interests	Astronomy
Notable works	Kitāb al-Hayʾah
Notable ideas	First non-Ptolemaic astronomical system; physical cause of celestial motions
Influenced	Grosseteste, Albertus Magnus, Roger Bacon, Regiomontanus, Copernicus[1]

However, it is not known whether the Andalusian cosmologists had access or knowledge of Eudoxus works.[4]

One original aspect of al-Biṭrūjī's system is his proposal of a physical cause of celestial motions. He combines the idea of "impetus" (first proposed by John Philoponus) and the concept of *shawq* ("desire"), of Abū al-Barakāt al-Baghdādī, to explain how energy is transferred from a first mover placed in the 9th sphere to other spheres, explaining the other spheres' variable speeds and different motions. He contradicts the Aristotelian idea that there is a specific kind of dynamics for each world, applying instead the same dynamics to the sublunar and the celestial worlds.[4]

His alternative system spread through most of Europe during the 13th century, with debates and refutations of his ideas continued up to the 16th century.[1] Copernicus cited his system in the *De revolutionibus* while discussing theories of the order of the inferior planets.[1]

Works

Al-Bitruji wrote *Kitāb al-Hayʾah* (Arabic: كتاب الهيئة, romanized: *Book of the Structure*), which presented criticism of Ptolemy's *Almagest* from a physical point of view. It was well known in Europe between the 13th and the 16th centuries and was regarded as a valid alternative to Ptolemy's *Almagest* in scholastic circles.[4]

This work was translated into Latin by Michael Scot in 1217 as *De motibus celorum* [7] (first printed in Vienna in 1531). Moses ibn Tibbon translated it into Medieval Hebrew in 1259.[4]

There is also an anonymous treatise on the tides (Escorial MS 1636, dated 1192), which contains material seemingly borrowed from al-Bitruji.[4]

Notes

1. Samsó 1980.

2. Vernet. "al-Biṭrūdjī" (http://referenceworks.brillonline.com/entries/encyclopaedia-of-islam-2/al-bitrudji-SIM_1462?s.num=1&s.q=%22arab+astronomer%22) .

3. Salim Ayduz, Caner Dagli (2014). *The Oxford Encyclopedia of Philosophy, Science, and Technology in Islam*. Oxford University Press. p. 106. ISBN 978-0-19-981257-8.

4. Samsó 2007.

5. Bernard R. Goldstein (March 1972). "Theory and Observation in Medieval Astronomy", *Isis* **63** (1), p. 39-47 [41].

6. Ptolemaic Astronomy, Islamic Planetary Theory, and Copernicus's Debt to the Maragha School (http://www.bookrags.com/research/ptolemaic-astronomy-islamic-planeta-scit-021 234) , *Science and Its Times*, Thomson Gale.(inaccessible document)

7. Pederson, Olaf. (1978) Science in the Middle Ages. ed. by David Lindberg. Chicago: Chicago University Press. p. 321

References

- Samsó, Julio (2007). "Biṭrūjī: Nūr al-Dīn Abū Isḥāq [Abū Jaʿfar] Ibrāhīm ibn Yūsuf al-Biṭrūjī" (http://islamsci.mcgill.ca/RASI/BEA/Bitruji_BEA.htm) . In Thomas Hockey; et al. (eds.). *The Biographical Encyclopedia of Astronomers*. New York: Springer. pp. 133–4. ISBN 978-0-387-31022-0. (PDF version (http://islamsci.mcgill.ca/RASI/BEA/Bitruji_BEA.pdf))

- Samsó, Julio (1980) [1970-80]. "Al-Bitruji Al-Ishbili, Abu Ishaq" (http://www.encyclopedia.com/doc/1G2-2830904829.html) . *Dictionary of Scientific Biography*. New York: Charles Scribner's Sons. ISBN 0-684-10114-9.

Further reading

- Helaine Selin, *Encyclopaedia of the history of science, technology, and medicine in non western cultures*, p. 160